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(54) A pneumatic framework for coverings

(57) A pneumatic structure for supporting limp coverings is supported by a pressurised tubular flexible frame comprising a plurality of intercommunicating tubular bodies 3, maintained at a given internal pressure and supporting a covering envelope that either rests on or is anchored to the framework.

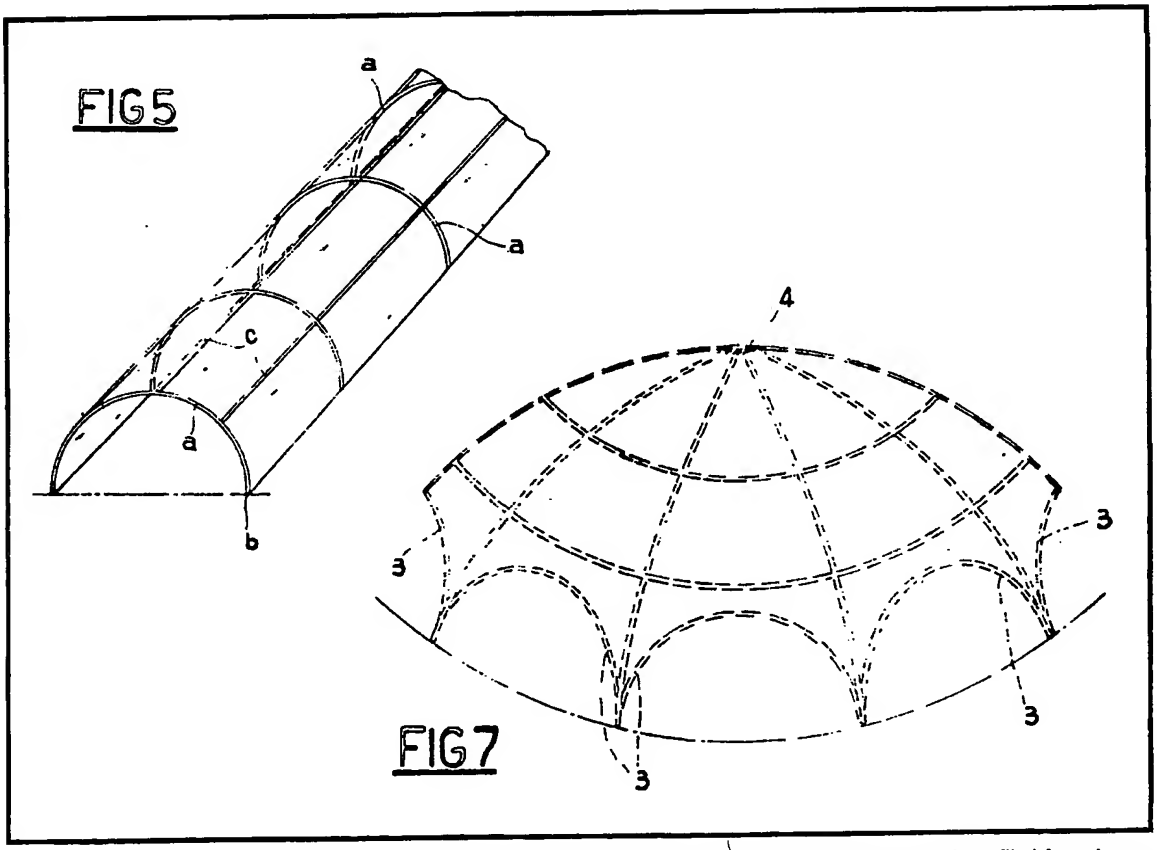

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FIG1

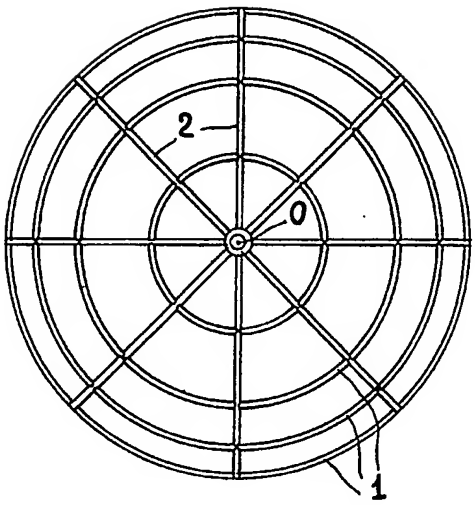


FIG2

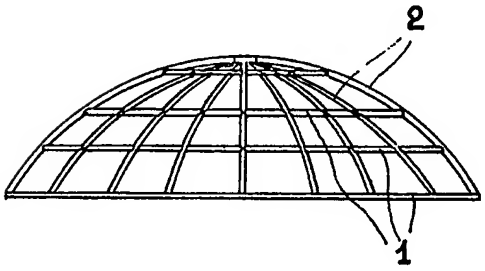


FIG3

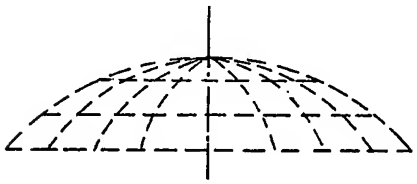


FIG4

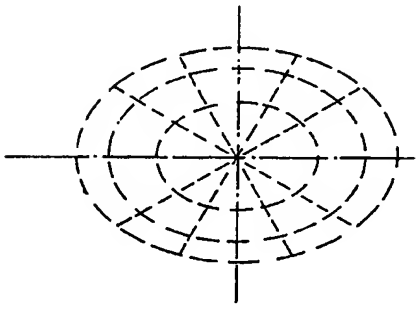


FIG5

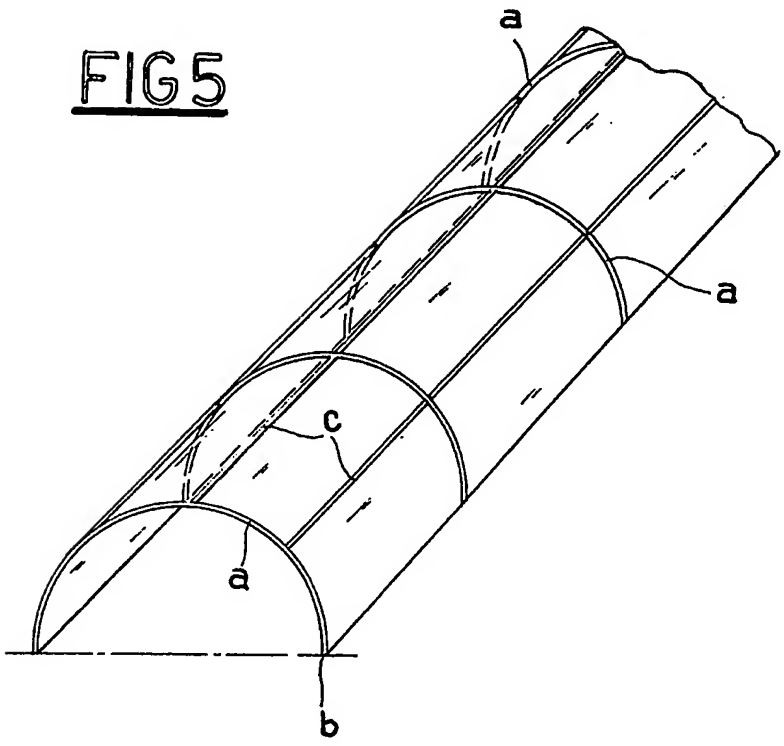
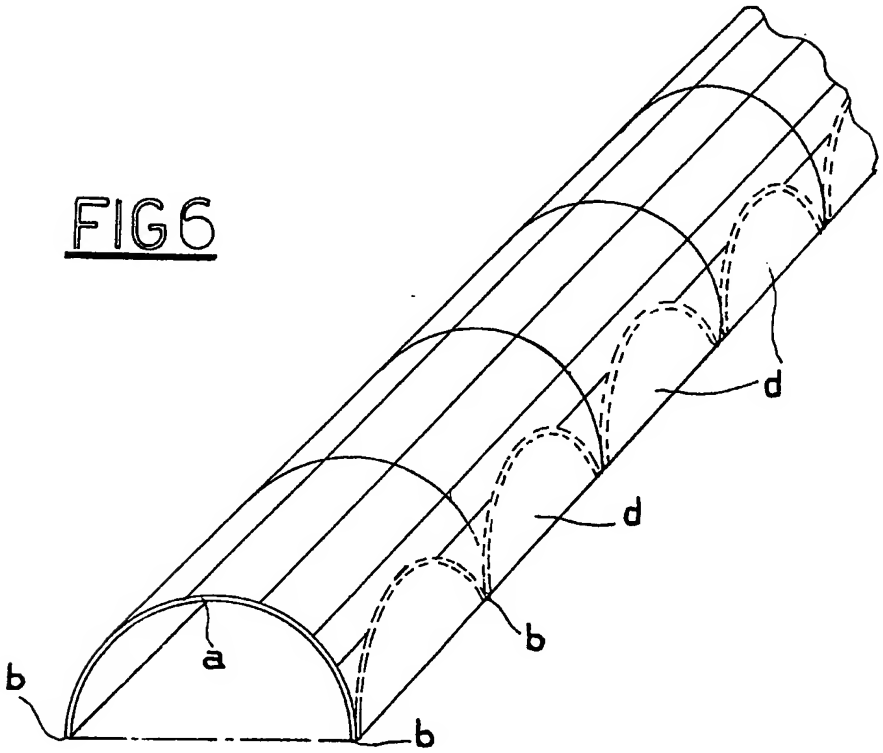


FIG6



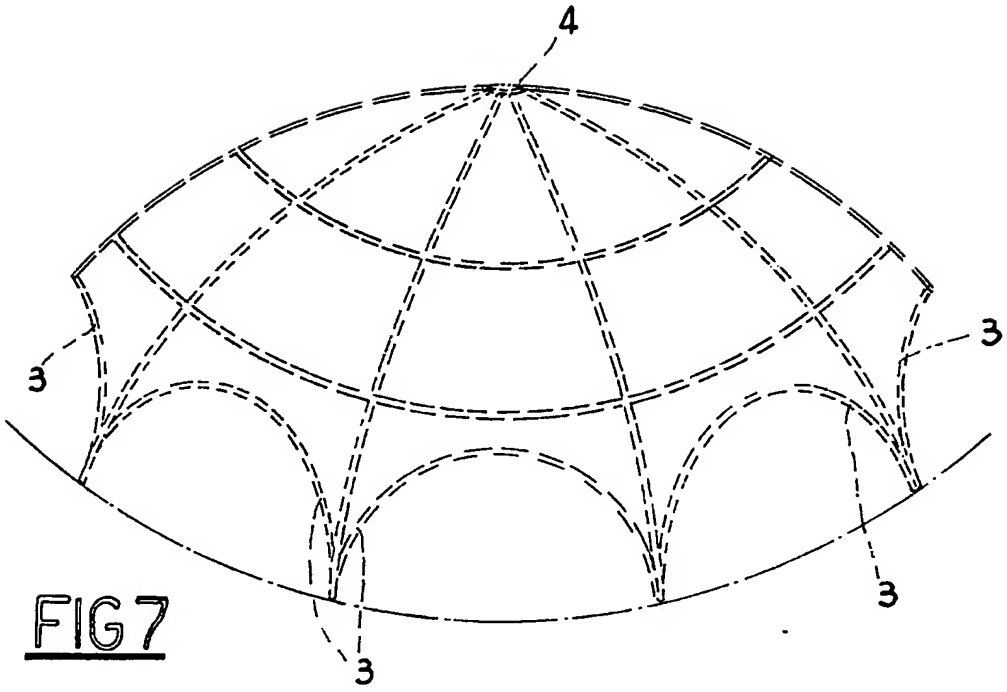


FIG 7

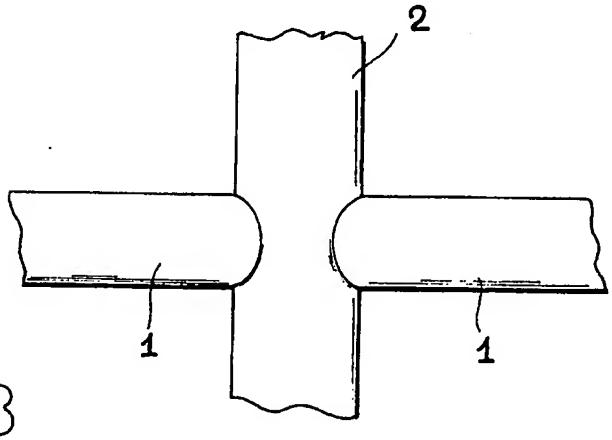


FIG 8

SPECIFICATION

A pneumatic structure for forming closed or even open coverings.

The subject of this invention is a pneumatic structure for forming closed or even open coverings.

Coverings made of plastic material, which have the characteristic of being able to cover very vast areas tent fashion and are supplied with compressed air to keep them inflated, have been known for some time. These particular coverings are used to shut in areas of land of the most varying sizes so as to form enclosures for a wide range of purposes.

Their essential good qualities are that it is possible to construct them in sizes that are considerable, even larger than circus bigtops, and that they can be set up in a very short space of time since all that has to be done is to convey them to the place of usage, anchor them down and inflate them.

It can be said that from the point of view of fast installation they constitute, without a doubt, the optimum form of realization. On the other hand, however, they do have the disadvantage that all the space they enclose has to be devoid of any relatively large openings, such as doors and windows, otherwise their internal pressure drops rapidly causing the construction to soften. This is derived from the fact that the said coverings do not, in reality, have any support structure and that they are simply kept suspended by pressurized air, and that if this should fail, they collapse on the ground.

The technical problem arises from the foregoing whether it is possible to produce a covering (of canvas or plastic) that incorporates a proper pneumatic support structure able to sustain it. In the affirmative, the covering, be it canvas or plastics, could be simply rested on the support structure which, once inflated and maintained at a controlled pressure, would substantially keep its shape, thereby making it possible to rapidly cover more or less ample areas so as to form covered spaces of even large dimensions, such as factory shop floors, that can be utilized on a long term basis, provided a suitable check is made on the pressure of the said structure.

The object of the present invention is to make available a pneumatic structure with which it is possible to solve the aforementioned problem, that can be installed very rapidly, if not almost instantaneously, in such a way that the said structure, placed for example in the back of a lorry, and carried to the site to be set up, can be inflated directly in the back of the lorry (or on a raised platform carried thereon) so that it can swell up and rise like a mushroom over and around the said lorry which, with the structure inflated, could thus set off immediately like this.

The present invention is based on the principle of a tyre which, once inflated using a suitable inner tube, keeps its shape defined by the outer cover unchanged and serves to sustain even weights that are considerable.

The pneumatic structure forming the subject of the present invention is characterized by the fact that it comprises: a plurality of tubular bodies, connected hermetically one to the other, to which is connected a covering envelope, forming one single intercommunicating ensemble provided with at least one point for inflating and deflating the said structure, the said ensemble defining, in conjunction with the said envelope, a perfectly taut geometrical area once the inflation operation has been carried out; a number of support members, locking the base of the said ensemble, placed at the same height from the support plane; and a number of stiffener rods for the said support members and for the said ensemble.

In order that it is possible to make optimum use of the tubular bodies, which may also be bent, it is obvious that the structure must, in practice, be in the form of a dome wherein the ribs are replaced with proper tubular arches connected to one another at various heights from the tubular bodies, circle fashion.

Although a spherical cover is the shape most suited to the structure forming the subject of the present invention, the same criterion can naturally be applied to create relatively flat domes, that is to say, large diameter spherical covers and domes with an elliptical base, which are relatively low and could even substitute circus bigtops.

The structure would be provided with a tubular ring base from which tubular arches of rubber (or some other proofed synthetic material), shaped suitably and in accordance with the functions the structures are to be called upon to perform, would extend, and these would be connected to a number of concentric, transverse, tubular rings that terminate towards the centre in a tubular sealing ring: the latter being necessary for fastening the tubular arches.

The tubular ring base would be positioned over a number of support members, the task of which would be to level the base on ground that is not flat and to support the whole structure at a certain height from the ground so as to enable very generous free space to be available; above the ring base there would be, in this way, the dome (the volume of this depending on the radius of the said ring base), and underneath the said ring, the set of support members that insulate the structure from the earth.

Inside this ring base, initially not inflated and resting on the supports, would be positioned, as stated above, the tubular arches

that are connected to one another from the covering envelope which would then be made taut through the inflation of the said arches (and of the corresponding transverse rings).

Should the structure be of the modular type, it would be indispensable at this stage to connect the modules to one another, using suitable hermetic sleeves which would render the common or individual inflation of the structures possible.

Any antennae that may have to be erected inside the covering could then be plumbed and inserted in holes that would allow them to slide towards the top of the dome, possibly with the aid of runners. The air filling operation could then be commenced by connecting a compressor to the inflation point of the structure.

The support members have to be suitably anchored down or braced, using steel tie rods, both during the assembly of the covering envelope and subsequently thereto when, with seams studied to give the said envelope the desired geometrical shape, it is raised and maintained inflated.

The subject of the present invention relates both to insulated pneumatic structures and to pneumatic structures already provided with a covering sheet. In the latter case, it is obvious that a covering for a garage for one motor vehicle can be transported to the site and set up in a very short space of time since it only needs to be anchored to the ground in a stable fashion. It is also possible to create large areas utilizable as deposits for various material and as improvised barracks.

With the structure that forms the subject of the present invention it is also possible to replace circus tents with the advantage that, using a suitably equipped lorry, the covering could be put up on the site in a few hours. Furthermore, it is obvious that, just by using the principle of centering ribs, that is to say tubular arches, it is possible to create extremely easily and in a very short space of time, galleries which could constitute, when completely covered in, storage space, or when instead open laterally, proper porticos that could be utilized, in particular, for health resorts, or else awnings that can be dismantled, to be used purely on special occasions or for particular ceremonies. It is obvious that in the case of porticos, both the structure and the sheeting can be selected in dimensions and at costs that are relatively low.

The fundamentals of the invention will now be better described with reference to the accompanying drawings which are purely of a schematic nature, in which:

Figure 1 shows, in a plan view, a circular dome shaped structure;

Figure 2 shows, in a lateral view, the structure illustrated in Fig. 1;

Figure 3 corresponds to Fig. 2 in the case of a low, spherical, cover, derived from a relatively large diameter sphere;

Figure 4 corresponds to an elliptical base dome;

Figure 5 shows a gallery structure of unlimited length;

Figure 6 shows a gallery structure open just on one side or on both sides;

Figure 7 shows a dome structure provided at the base with ample arch shaped openings, that is to say, with proper portals;

Figure 8 shows, diagrammatically, an example of a join between two tubular members.

With reference to Fig. 1, at = 1 = there are the tubular ring bodies, that is to say the actual tubular rings which, when the structure is inflated, are all positioned horizontally on suitable supports on the ground, should it not be flat. At = 2 = the ribs, that is to say the semi-circular tubular bodies, or tubular arches, are shown, which all point directly towards the geometrical centre = o =. The number of the various tubular bodies and their dimensions can naturally vary according to the requirements, and it is obvious that the covering envelope (not shown on the drawing) can be fitted on after inflation or that it can also be incorporated in the structure itself in such a way that when the structure is inflated, the envelope stays open, whilst when the structure is deflated, it can be folded along with the structure itself in order to make transportation easier.

As stated previously, steel tie rods are provided to better strengthen the structure. The said tie rods can be fitted so as to connect two opposite points of the various arches or circles. Once inflated, the structure has to be suitably anchored to the ground in the region of its base.

Figs. 3 and 4 are purely indicative since the dimensions of the cover and of the elliptical dome can be chosen from between widely different limits.

With reference to Fig. 5, it should be noted in this case that the arched members = a = equivalent to the arches = 2 = can be interconnected in two's for inflation, in such a way as to form many members, with four support points = b =, anchored to the ground and connected to horizontal tubular members = c =, to thus form a gallery structure.

The structure illustrated in Fig. 6 is, in practice, derived from that shown in Fig. 5 but in the former the lowest horizontal tubular members have been omitted so as to provide the covering with the lateral openings Pd =.

Fig. 7 shows, in practice, the dome illustrated in Fig. 1 but in the former the portals = 3 = have been made in the base. The figure in question also illustrates a tubular sealing ring = 4 = placed centrally at the top, which serves as the connection point for the various centering ribs (or tubular arches).

Fig. 8 simply shows how the tubular members = 2 = that form the centering ribs (or

tubular arches) with the tubular rings = 1 = are connected to one another using tubular sleeves in the form of a cross.

Once the inflation operations have ended, the connection sleeve to the inflation point of the structure (not illustrated) can be temporarily disconnected, and the compressor (also not illustrated) can be used to inflate an adjacent structure or for some other site operation that requires a compressor.

Domes inflated and levelled in this way will be found to be placed at a constant height even when the ground is not flat.

The covering envelope for the dome would then have to be fitted, the purpose of this being to close the vault, leaving the necessary passages to the entrances, to any safety exits, to the window and door frames provided and to all access points it is deemed suitable to leave open to the public or to motor vehicles, freely utilizable.

The larger structures, of a radius of 15–20 linear metres, in the form of domes or semi-ellipsoids, elongated by rectangular structures, could be used, for example, to cover circuses, indoor swimming pools, open air theatres, open air cinemas, industrial shop floors, temporary garages for fairs and exhibitions, as sites for mobile or stationary displays, as permanent or movable showrooms, to cover the construction of bridges and roads during the winter months, for the construction of hangars for private aircraft, on lorries for travelling exhibitions, for temporary protection while there is bad weather, as amusement arcades of various types, and as provisional movable work places.

The smaller structures, with a covered area of some 100 square metres or less could be used, for example, for permanent or travelling exhibitions, on very uneven land, for minor exhibitions, as camps for soldiers on the move, as provisional shelters for motor vehicles and animals, as winter cattle sheds up in the mountains, as temporary tourist villages, as camps for campers on the move, for roundabouts and amusements, as temporary toilets, as dressing rooms at swimming pools, to cover small roofs undergoing repair, as small garages, as work places in assembly shops, as provisional shelters for various material, and as camps for workers who move from one site to another.

It is understood that the invention is not limited purely to the form of embodiment described above and that variants and improvements can be made thereto, without in any way deviating from the framework of protection afforded to the invention, the fundamental characteristics of which are summarized in the claims listed hereinafter.

CLAIMS

1. A pneumatic structure for forming closed or even open coverings, essential features of which are that it comprises: a plurality of tubular bodies, connected hermetically one to the other, to which is connected a covering envelope, forming one single intercommunicating ensemble provided with at least one point for inflating and deflating the said structure, the said ensemble defining, in conjunction with the said envelope, a perfectly taut geometrical area once the inflation operation has been carried out; a number of support members, locking the base of the said ensemble, placed at the same height from the support plane; and a number of stiffener rods for the said support members and for the said ensemble.

2. A structure according to Claim 1, wherein the said ensemble is constituted, once the inflation has been carried out, by a tubular ring base connected hermetically to tubular arches that extend over vertical planes, the latter connecting hermetically with a number of transverse, tubular, rings of decreasing dimensions that go from the bottom upwards.

3. A structure according to Claim 2, wherein the said tubular ring base, the said tubular arches and the said transverse, tubular, rings, are, once inflation has been carried out, elliptic in shape.

4. A structure according to Claim 1, wherein the said ensemble is constituted, once inflation has been carried out, by a number of tubular arches parallel to one another and connected hermetically by horizontal tubular members.

5. A structure according to any of the preceding claims, wherein the said covering envelope is provided with at least one opening that defines access to the inside of the said structure.

6. A structure according to any of the preceding claims, wherein the said covering envelope is placed above the said intercommunicating ensemble.

7. A structure according to any of the preceding claims, wherein the said covering envelope is secured to the said intercommunicating ensemble in the region of the intersection points of the said tubular bodies.

8. A structure according to any of Claims 1 to 5, wherein the said covering envelope is constituted by a number of sheets secured circumferentially to the said tubular bodies.

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